

CLAIMS

I claim:

1. A fuel injector having field replaceable components exchangeable to change at least one of said fuel injector's characteristics, said fuel injector comprising:

an electrical power connector adapted to receive a fuel injector energization signal;

an electrical actuating coil electrically coupled to said electrical power connector and

5 powered by said fuel injector energization signal to controllably produce a magnetic field;

a ferromagnetically responsive needle movable responsive to variations in said magnetic field;

a valve seat having a fuel passage therethrough, said fuel passage selectively closed
10 or opened by said movement of said ferromagnetically responsive needle;

a fuel inlet for receiving fuel into said fuel passage;

a flow disk receiving fuel from said fuel passage and dispersing said fuel within an internal combustion engine; and

a housing enclosing said electrical actuating coil, said ferromagnetically responsive
15 needle, said valve seat, and said flow disk, said housing having a fuel inlet and a fuel outlet and further having a field removable and replaceable closure which provides field access to and replacement of said field replaceable components and thereby change at least one of said fuel injector's characteristics.

2. The fuel injector having field replaceable components of claim 1, wherein said housing further comprises a coil can assembly and a valve carrier, and said field removable and replaceable closure further comprises a valve seat carrier jam nut threadable onto said coil can assembly.
3. The fuel injector having field replaceable components of claim 1, further comprising:
 - a spring calibration tube effecting a first limit of longitudinal travel of said ferromagnetically responsive needle; and
 - a needle spring urging said ferromagnetically responsive needle away from said spring calibration tube;
 - said spring calibration tube and said needle spring enclosed within said housing and removable and replaceable through said field removable and replaceable closure.
4. The fuel injector having field replaceable components of claim 1, further comprising:
 - a longitudinally extensive valve seat location tube having a first end and a second end longitudinally distal to said first end, said first end capturing said valve seat adjacent said housing and further having a longitudinally extensive internal needle passage; and
 - a valve seat lock mechanically engaging said housing and capturing said longitudinally extensive valve seat location tube therein.
5. The fuel injector having field replaceable components of claim 1, further comprising a fuel tube defining said fuel inlet and passing at least partially through said electrical actuating

coil.

6. The fuel injector having field replaceable components of claim 5, further comprising a fuel filter having a unitary seal keeper.
7. The fuel injector having field replaceable components of claim 6, wherein said fuel filter further comprises a coupler for removably coupling to said fuel tube.
8. The fuel injector having field replaceable components of claim 1, further comprising a needle guide nested removably within said valve seat.
9. The fuel injector having field replaceable components of claim 1, wherein said flow disk further comprises a sheet material having fuel flow passages formed therethrough.
10. The fuel injector having field replaceable components of claim 4, wherein said valve seat location tube further comprises longitudinal fuel flow passages terminating adjacent said valve seat, said longitudinal fuel flow passages separate from said longitudinally extensive internal needle passage.
11. The fuel injector having field replaceable components of claim 1 where each of said field replaceable components is manufactured to allow visual identification of said field replaceable component's critical characteristic.

12. A method for adjusting at least one fuel injector for internal combustion engine operation in an internal combustion engine having a plurality of fuel injectors, comprising the steps of:

assembling said at least one fuel injector comprising field replaceable performance altering components;

providing a substitute for at least one of said field replaceable performance altering components in a performance altering geometry having critical characteristics sufficiently matched to said at least one of said field replaceable performance altering components to enhance said internal combustion operation by replacement of one of said alternate configurations with another of said alternate configurations;

modifying said fuel injector fuel dispensing characteristics by replacing said at least one of said field replaceable performance altering components with said substitute.

13. The method for adjusting a fuel injector for internal combustion engine operation of claim 12, wherein said step of modifying further comprises exchanging said at least one of said field replaceable performance altering components with said substitute in all of said plurality of fuel injectors.

14. The method for adjusting a fuel injector for internal combustion engine operation of claim 12, further comprising the step of forming visual indicia integral with said field replaceable performance altering components.

15. The method for adjusting a fuel injector for internal combustion engine operation of claim 12, wherein said step of modifying further comprises modifying a fuel injection fuel outlet opening.
16. The method for adjusting a fuel injector for internal combustion engine operation of claim 12, wherein said step of modifying further comprises modifying a fuel injection spray flow rate versus time profile during each injection cycle.
17. The method for adjusting a fuel injector for internal combustion engine operation of claim 12, wherein said step of modifying further comprises modifying a fuel injection response to electrical control.
18. The method for adjusting a fuel injector for internal combustion engine operation of claim 12, wherein said step of modifying further comprises modifying a fuel injector needle closing spring force.
19. The method for adjusting a fuel injector for internal combustion engine operation of claim 12, wherein said step of modifying further comprises modifying a fully opened injector needle height from said valve seat.
20. The method for adjusting a fuel injector for internal combustion engine operation of claim 12, wherein said step of modifying further comprises modifying a magnetic force exerted by an electrical actuating coil during an actuation control signal to said injector.